

WHAT IS CLAIMED:

1. A lens assembly, comprising:
5 a moving magnet component;

a stationary coil component; and

10 a moving lens component coupled to said moving magnet component, said moving magnet component configured to move said moving lens component relative to said stationary coil component.
- 15 2. The lens assembly of claim 1, wherein said moving magnet component comprises a permanent magnet.
- 20 3. The lens assembly of claim 2, further comprising a lens guidance mechanism coupled to said moving lens component.
- 25 4. The lens assembly of claim 3, further comprising a damping mechanism coupled to said moving lens component.
- 30 5. The lens assembly of claim 3, wherein said lens guidance mechanism comprises one or more guide shaft mounting members movably received by one or more guide shafts.
- 35 6. The lens assembly of claim 3, wherein said lens guidance mechanism comprises one or more ferromagnetic fluid bearings.
7. The lens assembly of claim 2, further comprising a damping mechanism coupled to said moving lens component.

8. The lens assembly of claim 7, wherein said damping mechanism comprises one or more spring members.

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9. The lens assembly of claim 7, wherein said damping mechanism comprises one or more ferromagnetic fluid bearings.

10 10. The lens assembly of claim 2, wherein said moving lens comprises a moving focus lens or a moving zoom lens.

11 11. The lens assembly of claim 2, wherein said lens assembly is configured to be
15 positioned in a linear light path of an optical block.

12 12. The lens assembly of claim 11, wherein said optical block comprises a folded light path optical block.

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13 13. The lens assembly of claim 12, wherein said optical block comprises a closed circuit television optical block.

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14. An actuatable lens assembly, comprising:

a voice coil motor assembly, said voice coil motor assembly comprising at least one stationary coil component and at least one moving magnet
30 component; and

a moving lens coupled to said at least one moving magnet component so that said moving lens moves with said moving magnet component relative to said stationary coil component.

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15. The lens assembly of claim 14, wherein said moving magnet component comprises a permanent magnet.

16. The lens assembly of claim 15, further comprising a lens assembly housing, said stationary coil component being fixedly coupled to said lens assembly housing.

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17. The lens assembly of claim 16, further comprising a lens guidance mechanism coupled between said lens assembly housing and said moving lens, said lens guidance mechanism being configured to guide said moving lens in a reciprocal linear path along the longitudinal axis of said lens assembly.

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18. The lens assembly of claim 16, wherein said lens assembly housing comprises a lens barrel concentrically disposed around said moving lens, and wherein said stationary coil component comprises a spirally wound conductor coil disposed adjacent the inner side of said lens barrel.

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19. The lens assembly of claim 18, wherein said stationary coil component is thermally coupled to said inner side of said lens barrel; and wherein said lens barrel comprises a thermally conductive material.

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20. The lens assembly of claim 17, further comprising a damping mechanism configured to dampen movement of said moving lens component relative to said lens assembly housing.

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21. The lens assembly of claim 15, wherein said moving lens comprises a moving focus lens or a moving zoom lens.

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22. The lens assembly of claim 15, wherein said lens assembly is configured to be positioned in a linear light path of an optical block.

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23. The lens assembly of claim 22, wherein said optical block comprises a folded light path optical block.
- 5 24. The lens assembly of claim 22, wherein said optical block comprises a closed circuit television optical block.
25. An actuatable lens assembly, comprising:
- 10 a voice coil motor assembly, said voice coil motor assembly comprising at least one stationary coil component and at least one moving magnet component; and
- 15 a moving lens coupled to said at least one moving magnet component so that said moving lens moves with said moving magnet component relative to said stationary coil component; and
- 20 a lens assembly housing, said stationary coil component being fixedly coupled to said lens assembly housing, said moving lens being movably disposed within said lens assembly housing so that said moving lens moves with said moving magnet component relative to said lens assembly housing;
- 25 a lens guidance mechanism coupled between said lens assembly housing and said moving lens, said lens guidance mechanism being configured to guide said moving lens in a reciprocal linear path along the longitudinal axis of said lens assembly; and
- 30 a damping mechanism configured to dampen movement of said moving lens component relative to said lens assembly housing.
26. The lens assembly of claim 25, wherein said moving magnet component
- 35 comprises a permanent magnet.

27. The lens assembly of claim 26, wherein said lens guidance mechanism comprises one or more guide shafts fixedly coupled to said lens assembly housing;; and one or more guide shaft mounting members fixedly coupled to said moving lens component, each of said one or more guide shaft mounting members being movably received by one of said one or more guide shafts.

28. The lens assembly of claim 26, wherein said lens guidance mechanism comprises one or more guide shafts fixedly coupled to said moving lens component; and one or more guide shaft mounting members fixedly coupled to said lens assembly housing, each of said one or more of said guide shaft mounting members being slidably received by one of said one or more guide shafts.

29. The lens assembly of claim 26, wherein said lens guidance mechanism comprises one or more ferromagnetic fluid bearings concentrically disposed in operative relationship between said lens assembly housing and said moving lens component.

30. The lens assembly of claim 29, wherein at least one of said ferromagnetic fluid bearings comprises a pocket of ferromagnetic fluid positioned adjacent a magnetic field return path between said stationary coil component and said moving magnet components so as to contain the ferromagnetic fluid within said pocket.

31. The lens assembly of claim 26, wherein said lens assembly housing comprises a lens barrel concentrically disposed around said moving lens, and wherein said stationary coil component comprises a spirally wound conductor coil disposed adjacent the inner side of said lens barrel.

32. The lens assembly of claim 31, wherein said stationary coil component is thermally coupled to said inner side of said lens barrel; and wherein said lens barrel comprises a thermally conductive material.

33. The lens assembly of claim 31, wherein said moving magnet component comprises a magnetic tube concentrically disposed between said stationary coil component and said moving lens.

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34. The lens assembly of claim 33, further comprising a lens container disposed within and coupled to said magnetic tube so that said lens container moves with said moving magnet component relative to said lens assembly housing, said lens container supporting said moving lens in a position centered about the longitudinal axis of said lens assembly.

35. The lens assembly of claim 26, wherein said damping mechanism comprises one or more spring members operatively coupled between said moving lens component and stationary components of said lens assembly.

36. The lens assembly of claim 35, wherein said damping mechanism comprises a circular spring member coupled between said lens assembly housing and said moving lens.

37. The lens assembly of claim 26, wherein said damping mechanism comprises one or more ferromagnetic fluid bearings concentrically disposed in operative relationship between said lens assembly housing and said moving lens component

38. The lens assembly of claim 26, wherein said moving lens comprises a moving focus lens or a moving zoom lens.

39. The lens assembly of claim 26, wherein said lens assembly is configured to be positioned in a linear light path of an optical block.

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40. The lens assembly of claim 39, wherein said optical block comprises a folded light path optical block.

41. The lens assembly of claim 39, wherein said optical block comprises a closed circuit television optical block.

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42. An optical block assembly, comprising one or more actuatable lens assemblies operatively disposed in a linear light path of said optical block, each of said one or more actuatable lens assemblies comprising:

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a moving magnet component;

a stationary coil component; and

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a moving lens component coupled to said moving magnet component.

43. The optical block assembly of claim 42, wherein said moving magnet component comprises a permanent magnet.

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44. The optical block assembly of claim 43, wherein said one or more actuatable lens assemblies each comprise either a moving focus lens or a moving zoom lens.

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45. The optical block assembly of claim 44, wherein said actuatable lens assembly further comprises a lens guidance mechanism coupled to said moving lens component, said lens guidance mechanism being configured to guide said moving lens in a reciprocal linear path along the longitudinal axis of said linear light path of said optical block.

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46. The optical block assembly of claim 45, wherein said actuatable lens assembly further comprises a damping mechanism coupled to said moving lens component.

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47. The optical block assembly of claim 45, wherein said actuatable lens assembly further comprises one or more ferromagnetic fluid bearings.

5 48. The optical block assembly of claim 44, wherein said optical block assembly comprises at least two of said actuatable lens assemblies, a first one of said at least two actuatable lens assemblies comprising a moving focus lens, and a second one of said at least two actuatable lens assemblies comprising a moving zoom lens.

10 49. The optical block assembly of claim 48, wherein said optical block comprises a folded light path optical block.

15 50. The optical block assembly of claim 49, wherein said optical block comprises a closed circuit television optical block.

20 51. The optical block assembly of claim 48, further comprising a computer control mechanism coupled to each of said first or second actuatable lens assemblies, said computer control mechanism configured to control movement of said moving focus lens of said first actuatable lens assembly in tandem with movement of said moving zoom lens of said second actuatable lens assembly such that the movement speed of said moving focus lens equals the movement speed of said moving zoom lens.

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52. A method of moving a lens disposed within a lens assembly, comprising:

providing a lens assembly, said lens assembly comprising:

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a moving magnet component,

a stationary coil component, and

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a moving lens component coupled to said moving magnet component, said moving magnet component configured to move said moving lens component relative to said stationary coil component, and

moving said moving lens component by generating current within said stationary coil component.

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53. The method of claim 52, wherein said moving magnet component comprises a permanent magnet.

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54. The method of claim 53, further comprising guiding movement of said moving lens component using a lens guidance mechanism coupled to said moving lens component.

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55. The method of claim 54, further comprising damping movement of said moving lens component using a damping mechanism coupled to said moving lens component.

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56. The method of claim 53, wherein said moving lens comprises a moving focus lens or a moving zoom lens.

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57. The method of claim 53, wherein said lens assembly is positioned in a linear light path of an optical block.

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58. The method of claim 57, wherein said optical block comprises a folded light path optical block.

59. The method of claim 53, wherein said optical block comprises a closed circuit television optical block.

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60. The method of claim 57, further comprising controlling said movement of said moving lens component in tandem with controlling movement of a different moving lens component of a different lens assembly of said optical block such that the

movement speed of said moving lens component equals the movement speed of said different moving lens assembly.

5 61. A lens assembly, comprising:

a stationary lens assembly housing;

a moving lens component coupled to said stationary lens assembly housing;

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a lens actuator coupled to said moving lens component and configured to move said moving lens component relative to said stationary lens assembly housing; and

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a lens guidance mechanism coupled to said moving lens component, said lens guidance mechanism comprising one or more ferromagnetic fluid bearings.

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62. The lens assembly of claim 61, wherein said lens actuator comprises a moving magnet component and a stationary coil component, said moving lens component being coupled to said moving magnet component, and said moving magnet component configured to move said moving lens component relative to said stationary coil component.

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63. The lens assembly of claim 61, wherein said lens actuator comprises a DC motor.

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